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(54) Speech device for telephonic apparatus

(57) A speech device which is arranged to output clear, "real" speech may be incorporated into, for example, a telephone. A telephone incorporating the speech device is arranged for the speech device to repeat individual numbers depressed and/or the sequence of numbers inputted so that a visually impaired person can check that the correct numbers have been inputted.

The speech may be stored in an analogue form so that a clear human speech output is produced. The telephone may also include buttons 18 which are of large size and are visually contrasting compared to the background from which they project.

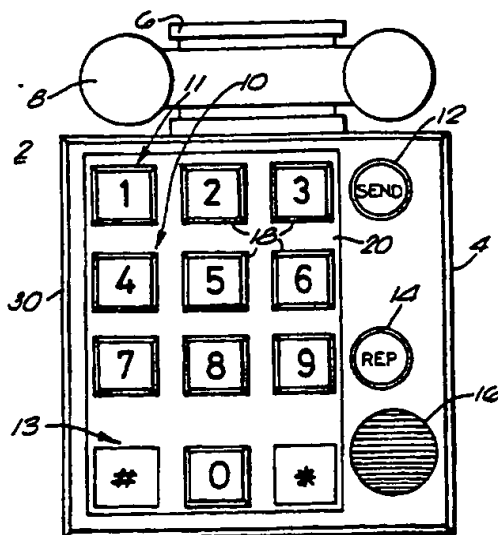


FIG. 1

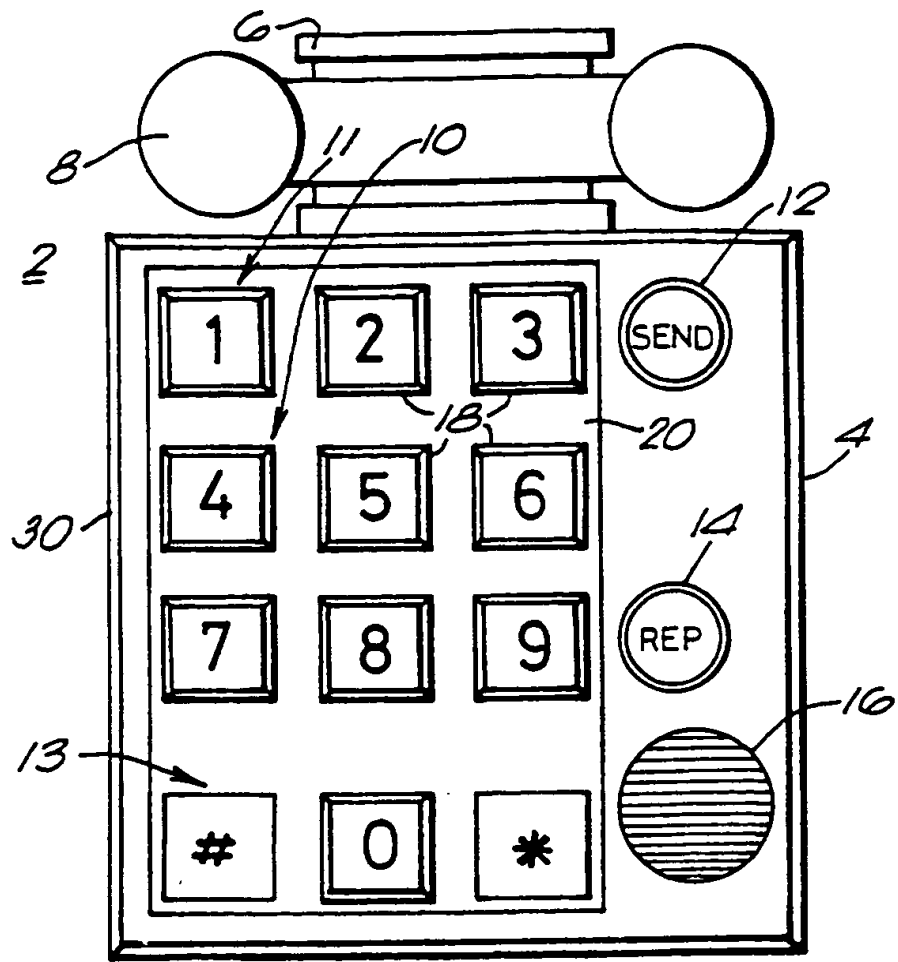


FIG. 1

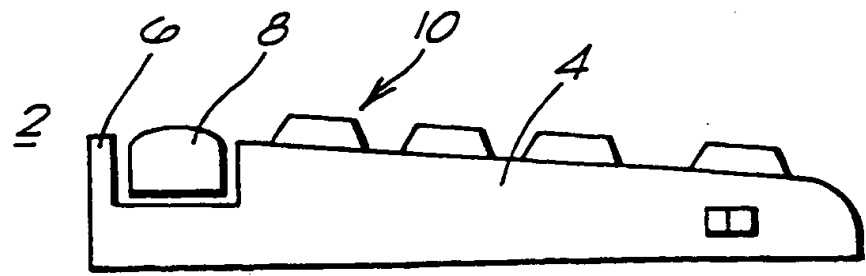
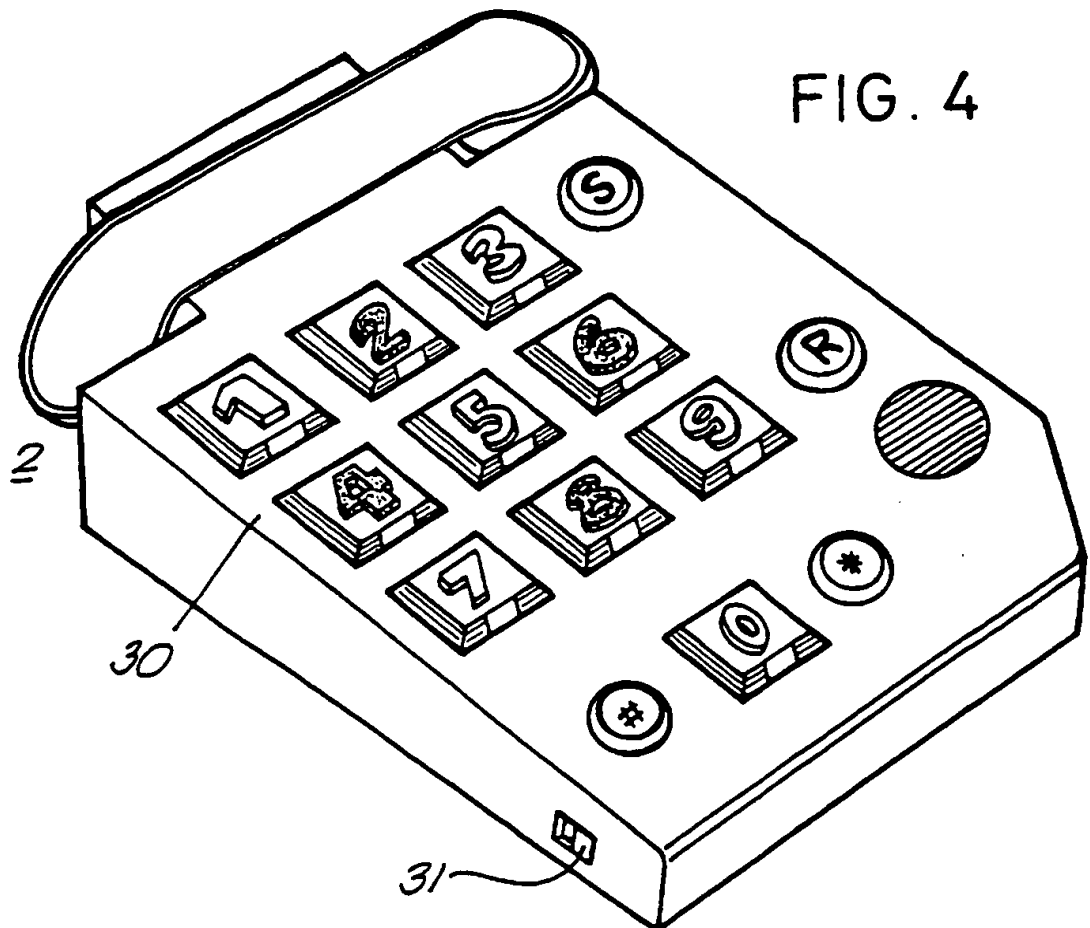
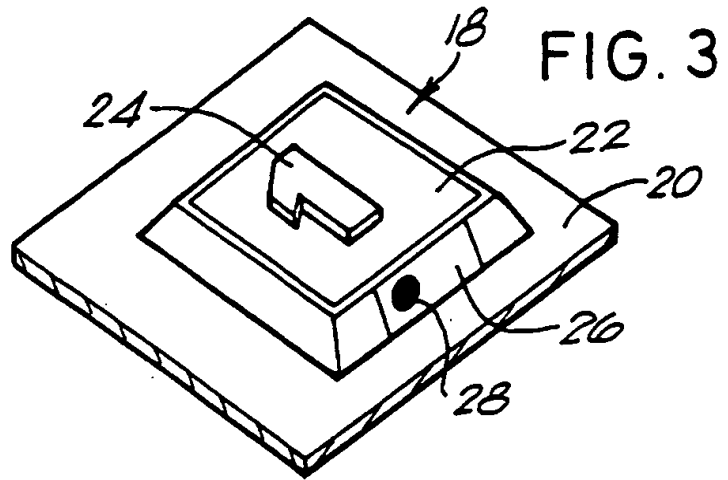


FIG. 2



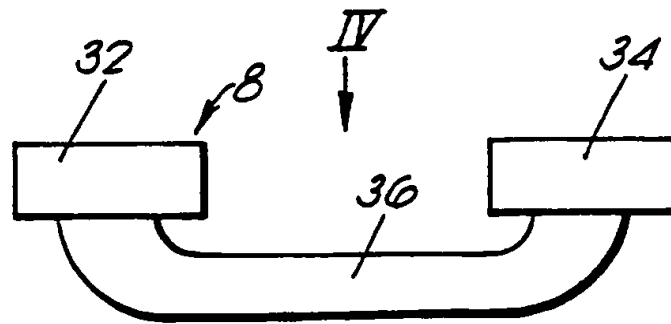


FIG. 5

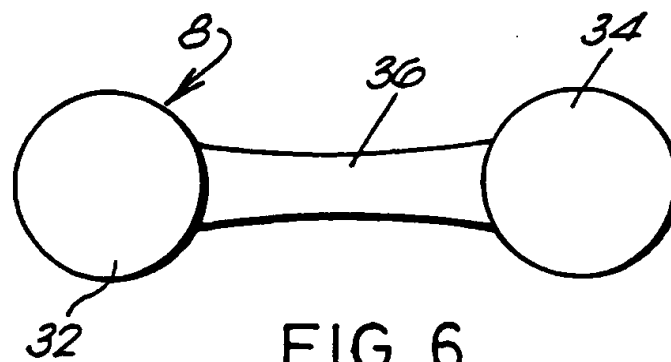


FIG. 6

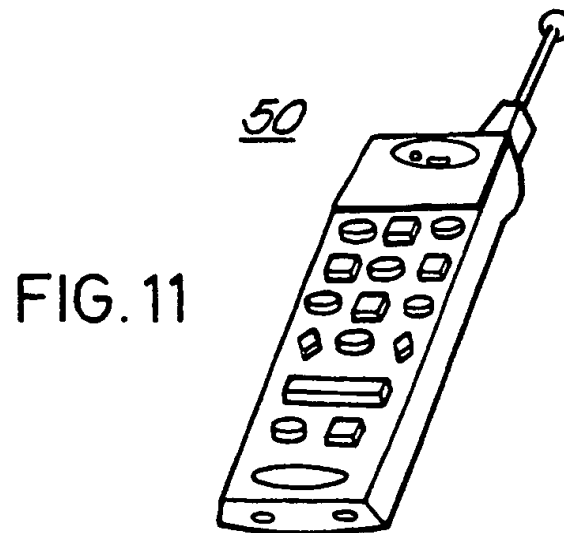
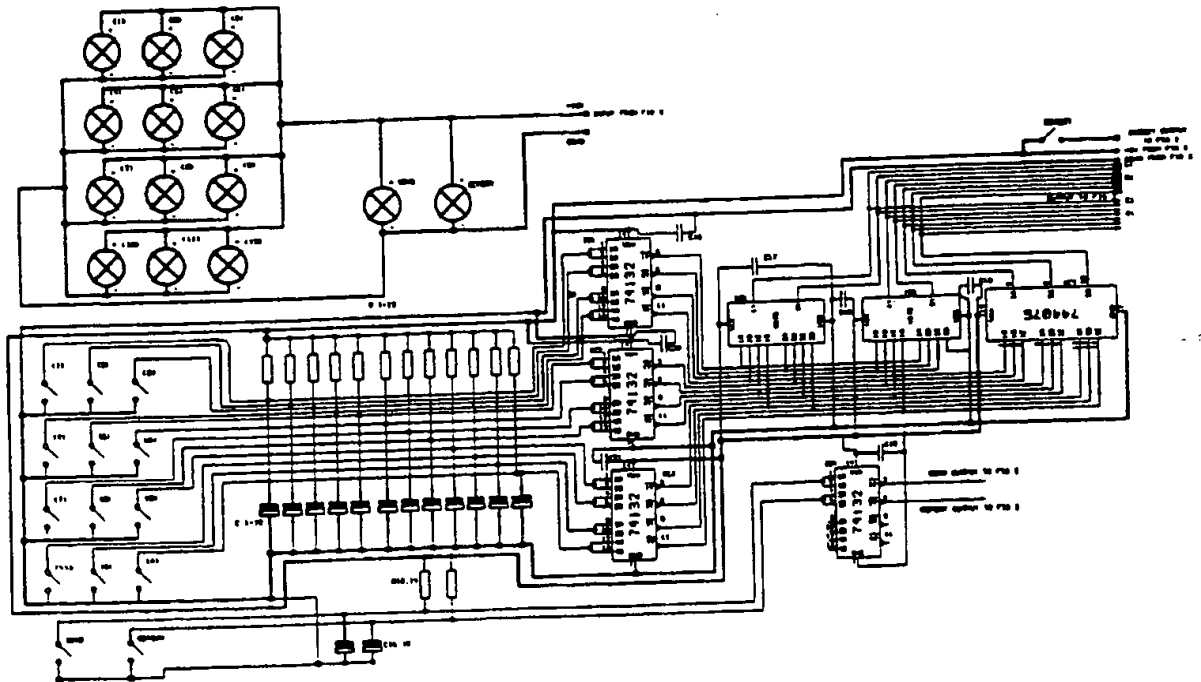


FIG. 11

FIG. 7



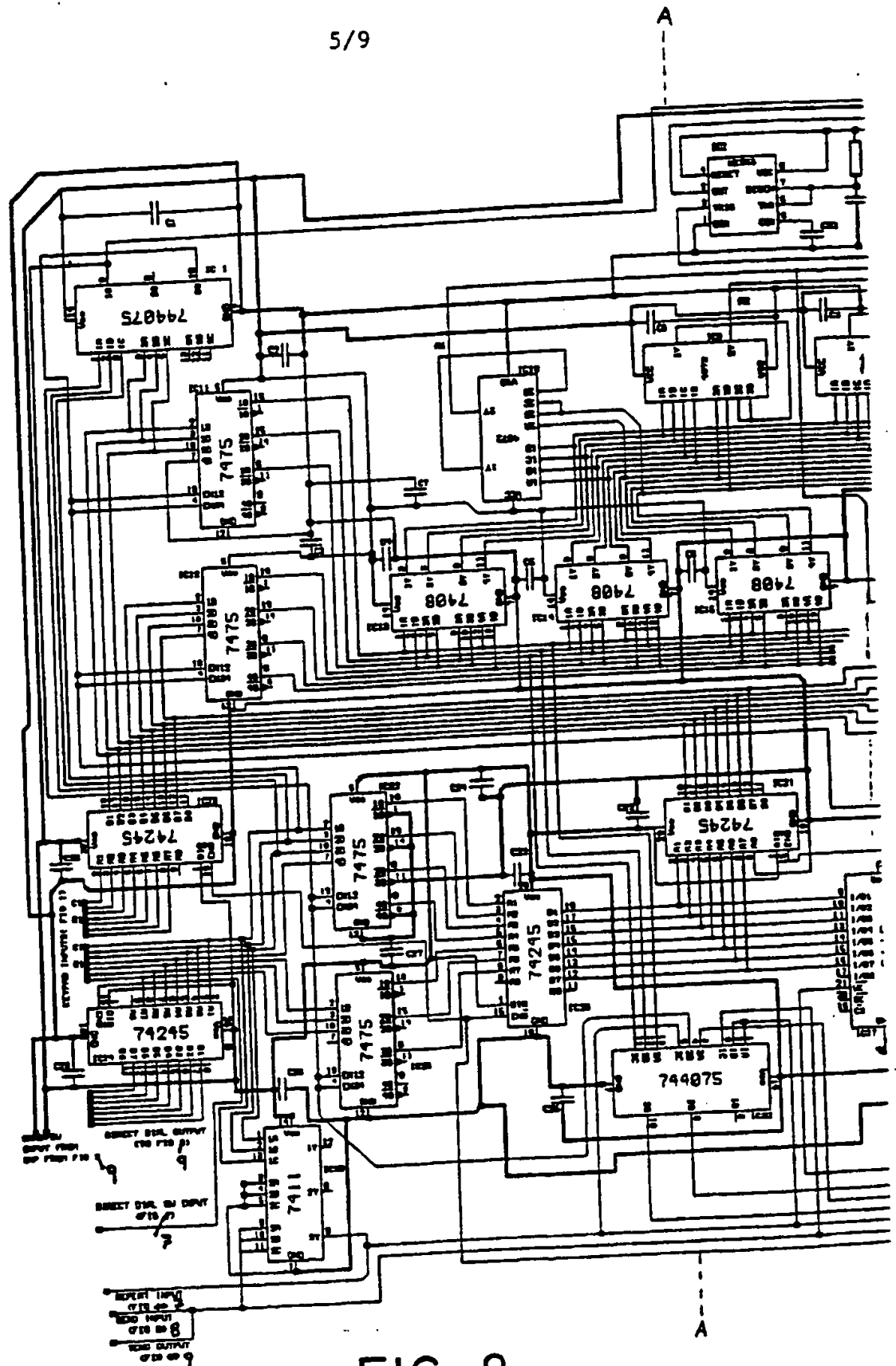
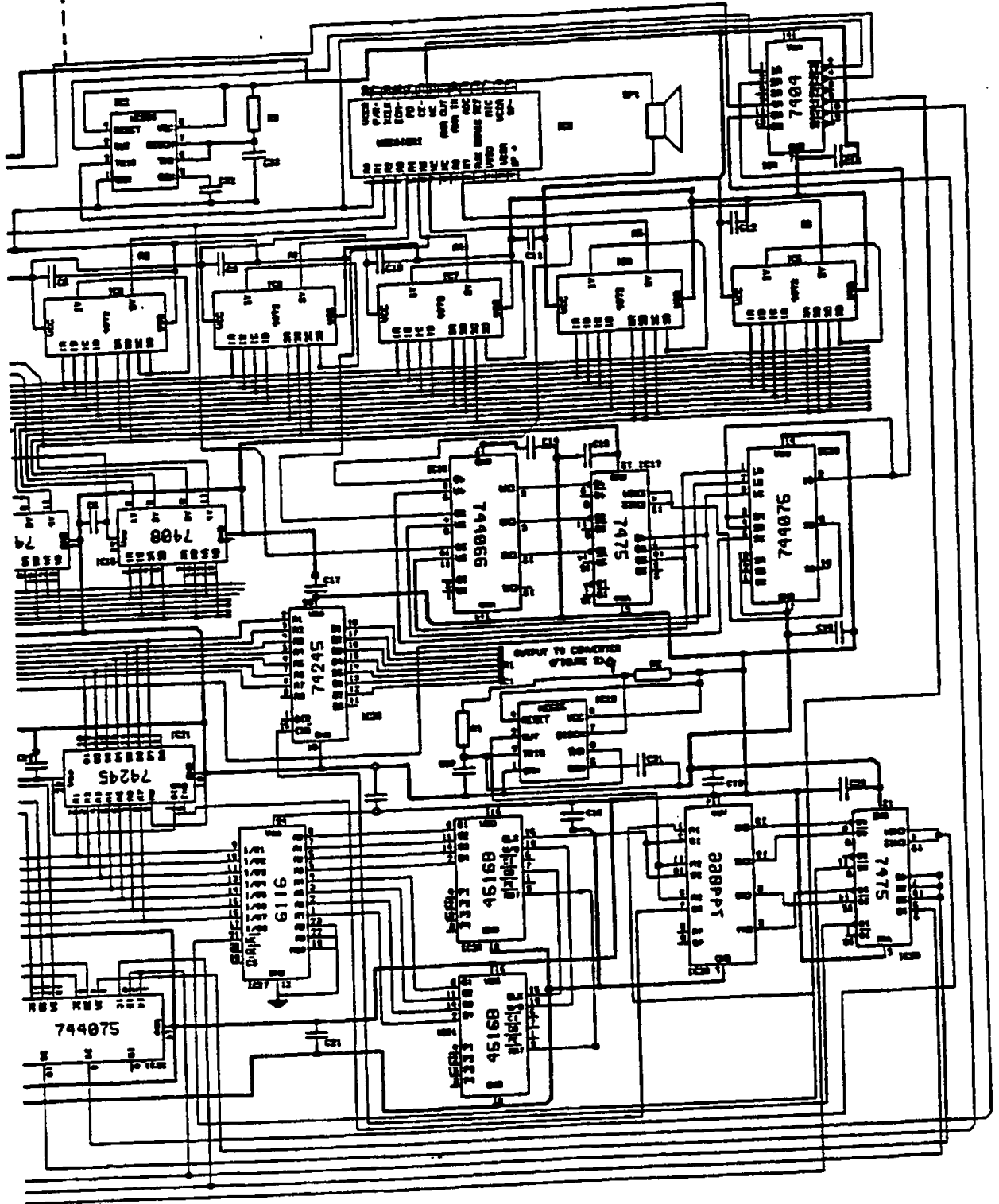


FIG. 8



A

FIG. 9

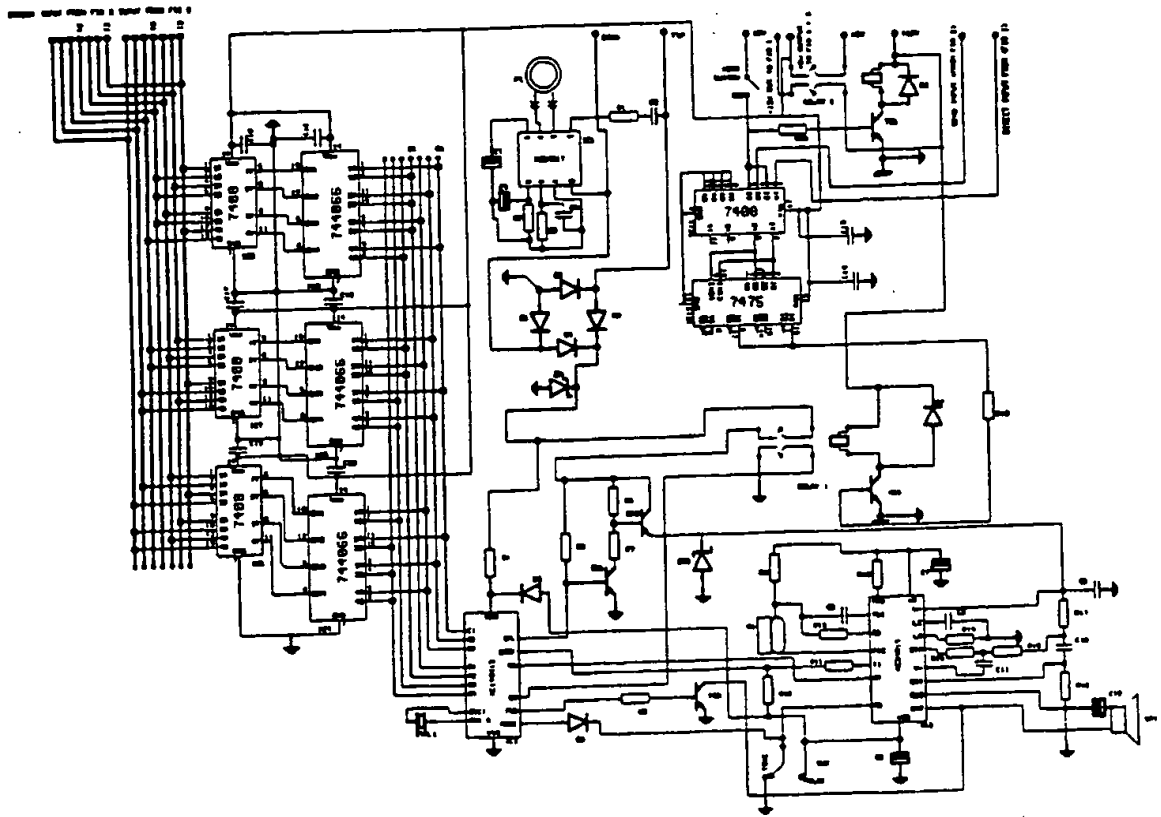


FIG. 10

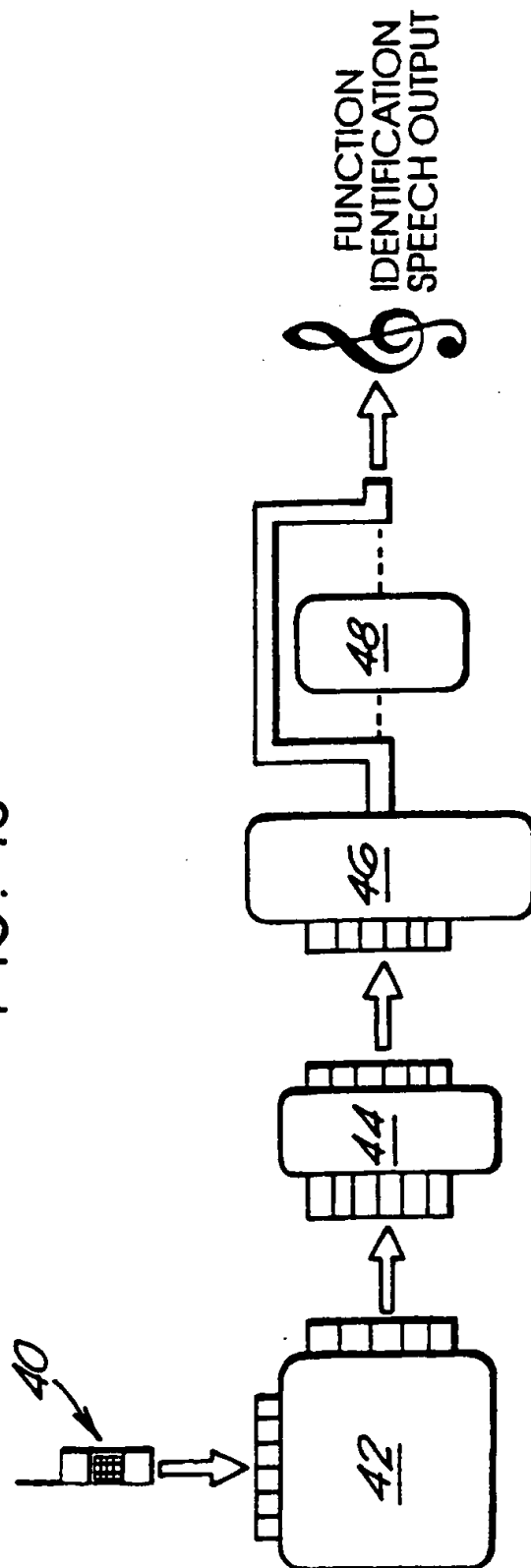
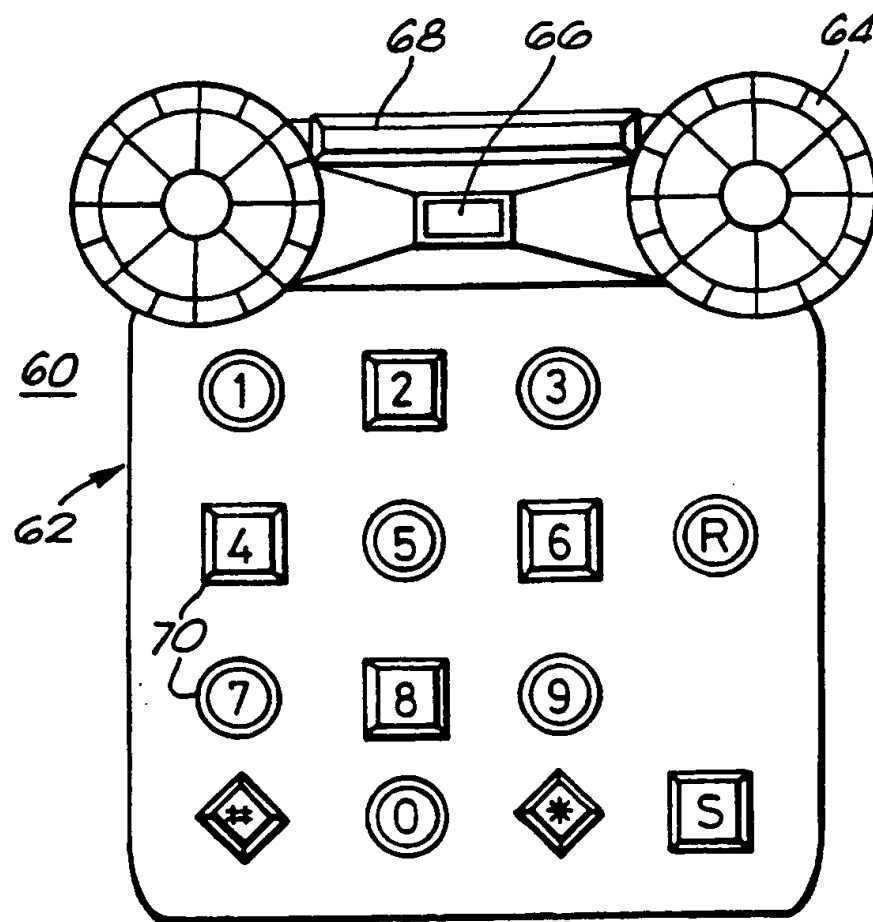


FIG. 12



CONTROL MEANS

This invention relates to a control means for controlling a device. Particularly, although not
5 exclusively, the invention relates to a control means, for example of a keypad, for a telecommunication device, for example a telephone.

Keypads are widely used for controlling the operation
10 of many different types of devices, for example telephones, microwave ovens, televisions, hi-fi equipment and cash dispensing machines. The keypads generally comprise an array of push buttons or pads which may project from or otherwise be associated with a background
15 member. The background member may be in one colour, often black and the buttons or pads in another colour. Alternatively, the background member may be in one colour and the buttons or pads in the same colour but each being provided with an identifier, for example a numeral or a
20 word, in a different colour.

Visually impaired (and other disabled) people have great difficulty in correctly identifying the desired buttons/pads to operate on known keypads. As a result,
25 many devices arranged to be operated by keypads cannot be operated comfortably or at all such people.

Some devices for visually impaired people incorporate a speech device which is arranged to provide an audible
30 output when a button or pad of a keypad of the device is operated. The audible output may comprise a synthesized voice which identifies the button or pad depressed. However, most synthesized voices used provide a indistinct output and, accordingly, known speech devices have only
35 limited effectiveness for aiding visually impaired people.

Preferred embodiments of the present invention aim to address the aforementioned problems.

According to a first aspect of the present invention,
5 there is provided control means for controlling operation
of a device, the control means having a plurality of
control elements for controlling functions of the device
and being associated with a background means, respective
10 identifiers which include a character or characters for
identifying the function of each control element
optionally being associated with each control element,
wherein the surface appearance of each control element is
visually contrasting compared to an adjacent area of said
background means and each control element is visually
15 distinguishable from an adjacent control element by a
distinguishing means other than said identifiers.

Said control means may be for controlling any type of
device. Preferably, however, it is for controlling an
20 electrical or electronic device, for example a telephone,
television, timing device, cooking appliance, calculating
device, sound recording and/or playback device or the
like.

25 Said control means may include at least two control
elements, preferably at least four and, more preferably at
least six. In an especially preferred embodiment, at least
ten control elements are provided.

30 Preferably, said control elements include a character
or characters thereon which are suitably alpha-numeric.
For example, at least some of the characters may be
numerals. Where a character or characters is provided,
each is preferably fixed relative to a respective control
35 element, suitably so as to form part of the surface

appearance of the control element. In this event, said character or characters is/are arranged to be visually contrasting compared to other parts of the associated control element.

5

Preferably, the colour and/or shade of each control element is visually contrasting compared to said background means. Preferably, each control element is provided in a primary colour or a mixture of primary
10 colours, but preferably not including white. In preferred embodiments, said control elements include at least one colour selected from red, blue, yellow, green and orange. Said colours may be fluorescent to aid their distinctiveness.

15

Said background means may be provided in a relatively neutral colour or black. Preferably, said background means is provided in black, any shade of grey or white, at least in part.

20

Each of said control elements may be arranged to be illuminated to increase visual contrast compared to said background means.

25

Preferably, each control element is visually distinguishable from an adjacent control element by adjacent elements having visually contrasting surface appearances and/or different shapes. For example, in one embodiment one element may be red and an adjacent element
30 may be blue. In another embodiment, one element may have a circular cross-section and an adjacent element may have a square or diamond-shaped cross-section. In some circumstances adjacent elements may have both different surfaces appearances and different shapes.

35

Said control elements preferably project above the level of said background means, suitably by at least 3mm, preferably at least 4mm and, more preferably, at least 5mm. Said elements may have a width (or diameter in the case of circular elements) in the range 5mm to 60mm, preferably in the range 7mm to 40mm, more preferably in the range 8mm to 12mm. The dimension of said elements perpendicular to and in the same plane as said width may independently be in the same range as stated for said width.

Adjacent control elements preferably include a gap therebetween, suitably so that said background means is visible in the gap. The minimum width of said gap may be 3mm, preferably 4mm, more preferably 5mm. In some embodiments, the minimum width of said gap may be 10mm or above. The gap may not have a constant width. For example where square and circular cross-section control elements are adjacent with their centres aligned, the minimum width may be defined by the distance between the elements as measured along a line joining the centres. A maximum width may be measured between the points on the elements which can be joined by a straight line and which are spaced the greatest distance from one another. The maximum width may be at least 5mm, preferably at least 6mm, more preferably at least 7mm.

Preferably, said control means incorporates a speech device as hereinafter described, the speech device being arranged to provide an audible output on operation of a control element.

According to a second aspect of the invention, there is provided a speech device including speech storage means in which a plurality of recorded human speech terms are

stored, said device being arranged such that each respective stored speech term can be individually selected by a control means to provide an audible output.

5 Preferably, the speech device comprises a speech storage device which is able to store individual speech terms in an essentially analogue form.

10 Preferably, each individual speech term is stored within a particular addressing area of the speech storage device.

15 Preferably, each speech term is stored in related addresses within the speech storage device.

 Preferably, the speech storage device is arranged such that upon input of a start address thereto, an output from the speech storage device may be generated.

20 Preferably, following the start address input, the speech storage device will automatically read out from related address locations until a given speech term has been output in its entirety. The related address locations may comprise contiguous addresses of the speech
25 storage device.

 Preferably, each speech term is stored in the speech storage device together with an "end of message" tag.

30 Preferably, output of the speech term from the speech storage device will terminate once an end of message tag is encountered by the speech storage device.

35 The speech device is preferably provided with address decoding means for converting an output of the operation

means of an apparatus to an address start location of the speech storage device.

5 The address decoding means may comprise decoding logic which may convert a function selector output into a binary output, for instance, by converting a row/column output to a binary output signal.

10 Preferably, the address decoding means comprises an address storage ROM. The address storage ROM may receive the binary output from the decoding logic to generate the address start location. The address storage ROM may be an EPROM or similar.

15 The speech storage device may have an optional amplifier connected to an output thereof for amplifying the speech terms output.

20 The speech storage device may be pre-programmed with suitable speech terms. Alternatively/additionally, the speech terms may be entered by an end user.

25 Preferably, individual speech terms are entered into the speech storage device by activating a record function or similar which initialises a memory address of the speech storage device to record one or more analogue speech terms therein. Preferably, disabling of the record function causes termination of the recording operation and causes an "end of message" tag to be input to the speech
30 storage device.

The speech device may be incorporated within any suitable apparatus having one or more control elements as described herein. For instance, such apparatus may

comprise a cellular or ordinary telephone, a domestic appliance, etc.

5 The control means may comprise one or more function keys or selectors.

 According to the third aspect, there is provided apparatus incorporating a speech device according to said second aspect.

10

 According to a fourth aspect, there is provided telecommunication apparatus incorporating a control means according to said first aspect and/or a speech device according to said second aspect.

15

 Said communication apparatus may comprise any apparatus arranged to be connected to or associated with a telephone network and includes all types of telephones, answering machines, telefax machines and the like.

20

 Preferably, said apparatus incorporates both a control means and a speech device.

25 Preferably, said apparatus is arranged such that a telephone number to be dialled can be selected prior to connection of the apparatus to the network. Accordingly, a visually impaired person can take as long as necessary to select the telephone number to be dialled. First repeat means is preferably provide for repeating, preferably audibly, each individual telephone number selected. Preferably, second repeat means is provided for repeating, preferably audibly, the whole telephone number selected prior to connection of the apparatus to the telephone network. Correction means may be provided
35 whereby a number input into the apparatus can be corrected

and/or deleted. Connection means, for example operable by a control element of the type described herein, may be provided for causing the connection the apparatus to the telecommunication network and/or dialling the number input
5 into the apparatus.

Preferably, a handset of the telephone apparatus include at least two visually contrasting colours or shades. For example, for a one piece cellular telephone,
10 a fluorescent strip or other distinctive means may be provided around the telephone. For a two piece telecommunication apparatus, a part or parts of the handset, for example the earpiece and mouthpiece, may be of a different colour or shade to the part thereof
15 extending therebetween. In addition, for such an apparatus, a cradle for the handset may be visually contrasting compared to surrounding regions of the apparatus in order to facilitate location by a visually impaired person of the handset on the cradle.

20 Said telecommunication apparatus may include visual indication means for indicating an incoming call. Such means may comprise a flashing light, for example a strobe light and/or display means, for example a LCD display
25 means.

Any feature of any aspect of any invention or embodiment described herein may be combined with any feature of any other aspect of any invention or embodiment
30 described herein.

Specific embodiments of the invention will now be described, by way of example, with reference to the accompanying diagrammatic drawings, in which:

Figure 1 is a front elevation of the telephone;

Figure 2 is a side elevation of the telephone;

5 Figure 3 is an enlarged view of part of the keypad of
the telephone showing a single key;

10 Figure 4 is a perspective view of the telephone of
Figure 1;

Figure 5 is a side elevation of a telephone handset;

15 Figure 6 is a view of the handset of Figure 5 in the
direction of arrow VI in Figure 5;

Figure 7 is an electronic circuit diagram showing how
buttons of a keypad of the telephone are connected and
illuminated;

20 Figure 8 is an electronic circuit diagram showing
speech circuitry and how telephone number information is
inputted, stored, repeated and dialled;

25 Figure 9 is an electronic circuit diagram that
decodes inputs from buttons of the keypad to allow
acceptance by a telephone interface, the control circuits
of Figures 8 and 9 and a standard telephone subscriber
interface to allow access to the telephone network;

30 Figure 10 shows a flow chart for a speech system
implemented by the circuitry shown in Figure 8 and the
decoder circuitry shown in Figure 9;

35 Figure 11 is a perspective view of a cellular
telephone; and

Figure 12 is a front elevation of an alternative telephone, excluding a telephone handset thereof.

In the Figures, the same or similar parts are
5 annotated with the same reference numerals.

Referring to Figures 1 to 6, the telephone 2 includes a body 4 incorporating a cradle 6 in which handset 8 is seated. One major difference between the telephone 2 and
10 conventional telephones concerns features of control pad 10.

The control pad 10 comprises a 3x3 array 11 of buttons labelled 1-9 below which is arranged a row 13 of
15 three buttons labelled, "#", "0" and "*". Down the right hand side of the pad is a "SEND" button 12, a "REP" (or "repeat") button 14 and a loudspeaker 16.

Each of the buttons in the array 11 and row 13 is
20 generally as shown in Figure 3. Referring to the figure, button 18 projects from face 20 and has a frusto-pyramid shape. In its upper faces 2 it includes a raised, tactile alpha-numeric identifier 24 (in this case the numeral "1"). On its front face 26 it includes a braille
25 identifier 28. The button 18 is arranged to be depressed so that it moves relative to the face 20. The cross-section of button is about 25mm x 25mm and the height is about 10mm.

30 The buttons 12 and 14 have a circular cylindrical cross-section, with the words thereon raised and tactile. The diameter of the buttons is about 25mm and the height about 10mm.

The buttons of the control pad 10 are arranged so that a person can move his/her finger around each button without inadvertently pressing a button. To this end, the left hand edge of the array 11 and row 13 is spaced a distance of 1cm from the edge 30 of the face 20; each row of buttons in the array 11 is spaced 20mm from the adjacent row; each column of buttons in the array 11 is spaced 20mm from the adjacent column; and the buttons in row 13 are spaced 20mm from each other, the row itself being spaced 30mm from the bottom of array 11.

The control pad 10 is arranged so that persons with limited sight can make out the identity of the buttons. To this end, the face 20 may have a neutral colour, for example grey. The buttons in the array 11 and row 13 are made of a translucent coloured plastics material and each is lit from below so that the buttons can be illuminated in use. For example, the odd numbered buttons and the buttons labelled "0" may be coloured and/or illuminated red with the numeral thereon being green; the even numbered buttons may be coloured and/or illuminated blue with the numeral thereon being red; the "#" and "*" buttons may be coloured and/or illuminated yellow, with the identifier "#" or "*" being coloured red; the button 12 may be coloured and/or illuminated red with the word thereon in black; and the button 14 may be coloured and/or illuminated green with the word thereon being in black. It is found in practice that many visually impaired persons can make out the buttons when arranged as described.

In the event, however, that illumination of the buttons does not aid identification by a visually impaired person (as may be the case for some such persons) a switch 31 is provided whereby the illumination can be turned off.

The handset is arranged so as to be visually distinguishable from that of the body 4 and/or cradle 6 so that it can readily be located by a visually impaired person. For example, referring to Figures 5 and 6, the handset 8 may have a grey mouthpiece 32 and earpiece 34 but the portion 36 extending therebetween may be brightly coloured, for example by being orange.

The overall dimensions of the telephone 2 may be 260mm (length), 185mm (width), 20mm (minimum height) to 70mm (maximum height). Much of the electronic circuitry of the telephone 2 is conventional. However, the telephone incorporates other non-conventional features.

Firstly, the telephone is arranged so that when any of the buttons of the control pad are depressed, the identity of the button is stated audibly via the loudspeaker 16. This enables a visually impaired person to confirm the identity of a button selected. Advantageously, the circuitry for generating the speech produces relatively clear "real" human-sounding speech rather than the synthetic robotic-sounding speech usually associated with electronic apparatus incorporating speech functions. Further details of the circuitry are provided below with reference to Figures 7 to 10 and the description relating thereto.

A second non-conventional feature comprises a facility whereby a person can input a sequence of numbers to be dialled which are stored in a memory. The person may then cause the sequence of numbers inputted to be repeated audibly by pressing button 14. If any number is incorrect, then facility may be provided for deleting the wrong number in the sequence and replacing it with the correct number; or a less preferred alternative would be

for the person to be invited to input the correct sequence in its entirety for a second time. Only when the person is satisfied that the correct sequence has been inputted is the telephone connected to the telephone network.

5 Connection to the network simply involves the person pressing the SEND button 12 whereupon the desired number is dialled.

Advantageously, the feature described enables a

10 visually impaired person to take as long as necessary to input the correct numerical sequence, since only when the sequence inputted has been confirmed to be correct is the telephone connected to the network. With conventional

15 telephones, connection to the network takes place when the handset is picked up and from this instance there is a predetermined time for the desired sequence of numbers to be inputted. If the predetermined time is exceeded, the telephone is automatically disconnected from the network and, accordingly, the entire sequence of numbers must be

20 inputted again.

Thus, in summary, use of the telephone 2 is relatively easy for a visually impaired person. Firstly, the person selects the desired numerical sequence. In

25 doing this, the person may be able to visually make out the numbers on the buttons or alternatively may use his/her tactile sense to identify the buttons, either using the identifier 24 thereon or the braille identifier 28. Whilst identifying the buttons, the person can easily

30 move his/her fingers around the buttons without depressing them. After the input of each number in the sequence, the person may audibly check the number inputted and/or may cause the sequence or part sequence inputted to be audibly repeated by pressing REPEAT button 14. If any number

35 inputted is incorrect, then it may be deleted and replaced

with the correct number. Only after the correct sequence has been entered is the SEND button 12 depressed to connect the telephone to the network and make the telephone call.

5

Referring now to Figures 7 to 9, the circuitry of Figure 7 is connected to respective switches associated with each button of the control pad 10. When a button is depressed, a signal passes to the output(s) of Figure 8, enabling the circuitry of Figure 8 to determine which switch has been depressed. In addition, after the first depression of a button, power is supplied to the circuitry of Figures 7 and 8, from the circuitry of Figure 9 via relay 3 of Figure 9.

15

Two sets of inputs are taken from the circuitry of Figure 7. The first set controls the output from digital speech circuitry of Figure 8. The second set is used to feed the storage of telephone numbers in the circuitry of Figure 8.

20

When a signal is detected on the "repeat" input of Figure 7, the sequence of numbers that have been entered are retrieved from memory and sent to the digital speech circuitry of Figure 8 which causes the numbers entered by the user to be repeated.

25

When a signal is detected on the "send" input of Figure 7, the output of Figure 8 is enabled to the circuitry of Figure 9 and, consequently, the sequence of numbers entered is replayed from the memory.

30

The input from the circuitry of Figure 8 is connected to the standard telephone network via a decoding network that translates the information entered to a compatible

35

level of the dialling circuit, using the circuitry of Figure 9. Alternatively, input to the circuitry of Figure 9 is available directly, if desired, thereby bypassing the circuitry of Figure 9.

5

The speech system incorporated into the telephone 2 can have general application. A system suitable, in general terms, for use with any telephone or other device described herein is described below with reference to a cellular telephone.

10

Referring to Figure 10, there is shown a cellular telephone 40 with a number of function keys arranged in a matrix, decoding logic 42 for decoding row/column outputs from the function keys into a binary form, an address storage ROM 44, a speech storage device 46 and an optional amplifier 48.

15

Referring to the figure in more detail, when a function key of the cellular telephone is activated, a row and column address corresponding to the function key is output to the decoding logic section 42. The decoding logic takes the row and column address of the key and converts it into a binary value for input to the address storage ROM 44 which may be, for instance, an EPROM or similar. The address storage ROM has a number of addresses stored within it, each address corresponding to a position within the speech storage device 46 in which a particular sound term corresponding to the function key depressed on the cellular telephone is stored.

25

30

In preferred embodiments, the speech storage device 46 is a particular type of memory which is capable of storing analogue data in an analogue form. In other words, whereas normal memory devices are operated and

35

store digital data in a binary fashion, this device is able to store analogue signals, such as speech signals, as signals at a plurality of different levels, i.e. in an essentially analogue form. The advantage of using such a device is that it is able to provide an analogue output directly, without requiring the use of digital to analogue converters and analogue to digital converters and this greatly reduces the hardware requirement for speech storage.

10

Referring now more specifically to the particular manner in which the speech storage device 46 is addressed, the address storage ROM 44 is configured so as to output a given start address for a particular speech term which, in combination with a strobe signal, is provided to the speech storage device. When the address signal is validated by the strobe signal, output of the speech term from the speech storage device is commenced.

20

As it will be appreciated, particular speech terms will occupy more than one position in memory and, in preferred embodiments, a single speech term may be stored at contiguous memory addresses which are automatically cycled through when the input address signal is applied together with the strobe signal. When the speech term required has been read out of the speech storage device, the speech storage device will encounter an "end of message" signal alerting it to the fact that it has completed the output of a complete speech term and it will automatically stop producing its output.

30

The optional amplifier 48 may be attached to the speech storage device 46 so as to boost the analogue output from the storage device to a higher level. However, it should be noted that the output of the speech

35

storage device may itself be of a sufficient level for many applications and the amplifier need not be provided.

5 Briefly, the inputting of speech terms into such a speech storage device 46 will now be described, although it will be appreciated that in applications for specific end users it will not normally be necessary for such a user to input speech themselves into the storage device as this may be done at a manufacturing or pre-programming
10 stage.

To initiate speech input into the storage device, at a particular designated address, a record function is activated. Typically the record function is activated by
15 a record button. When that record button is depressed, analogue data may be input via a microphone and suitable interfacing circuitry into contiguous address locations of the storage device. When the record button is released, an end of message signal is generated to the speech
20 storage device so that the fact that a discrete portion of speech (or a speech term) may be recognised and retrieved later by the storage device.

From the description of the above system, it will be
25 apparent that the pressing of one of the function keys of the the telephone 40 device to cause a speech term output, may be likened to the depression of a play button. When the function key has been depressed, decoding and address storage logic performs the function of selecting the
30 correct area within the speech storage device in which the speech term is stored. The internal logic of the storage device itself then automatically produces the speech output and terminates the speech output when the full speech term has been generated.

Referring now to Figure 11 which shows the external appearance of a cellular telephone 50, the odd numbered buttons have a circular cross-section of 10mm diameter and a 5mm height and have yellow faces with black lettering; the function buttons "*" and "#" have a diamond-shaped cross-section of 10mm width and 5mm height and have red faces with black lettering; the "SEND" button has a rectangular cross-section of 30mm x 10mm and has a green face with black lettering; the "R" (or repeat) button has a circular cross-section of 10mm diameter and a 5mm height and has a yellow face with black lettering; and the "END" button has a square cross-section of 10mm width and 5mm height and has a red face and black lettering. The gap between adjacent buttons is about 5mm. The overall dimensions of the telephone 50 are 130mm (length), 70mm (width), 20mm (minimum height) to 30mm (maximum height).

The use of differently shaped buttons enables a visually impaired person to easily identify by his/her tactile sense the layout of the keypad. Furthermore, the use of visually contrasting colours for the buttons enables them to be picked out against the face of the telephone from which they project. Additionally, since adjacent buttons are both visually contrasting and differently shaped, this may further aid the assessment of their function by a visually impaired person. Furthermore, as described previously, the telephone 50 includes a speech system enabling a user to hear the function of any button depressed.

In order to make it easier for a visually impaired person to locate telephone 50, its body is provided with a fluorescent yellow band (not shown) around its perimeter.

Referring to Figure 12, a telephone 60 includes a body 62 incorporating a cradle 64. The cradle 64 includes a strobe light 66 arranged to flash when an incoming telephone call is received and an LCD display 68 arranged to provide a message alerting the receipt of an incoming call. Additionally, the cradle is provided in a colour which contrasts with the surrounding area to aid the location of a handset thereon. Adjacent buttons 70 of the telephone are differently shaped and, in addition, differently coloured as in the Figure 11 embodiment. The spacing between adjacent buttons is approximately equal to the diameter thereof.

The reader's attention is directed to all papers and documents which are filed concurrently with or previous to this specification in connection with this application and which are open to public inspection with this specification, and the contents of all such papers and documents are incorporated herein by reference.

All of the features disclosed in this specification (including any accompanying claims, abstract and drawings), and/or all of the steps of any method or process so disclosed, may be combined in any combination, except combinations where at least some of such features and/or steps are mutually exclusive.

Each feature disclosed in this specification (including any accompanying claims, abstract and drawings), may be replaced by alternative features serving the same, equivalent or similar purpose, unless expressly stated otherwise. Thus, unless expressly stated otherwise, each feature disclosed is one example only of a generic series of equivalent or similar features.

The invention is not restricted to the details of the foregoing embodiment(s). The invention extends to any novel one, or any novel combination, of the features disclosed in this specification (including any
5 accompanying claims, abstract and drawings), or to any novel one, or any novel combination, of the steps of any method or process so disclosed.

CLAIMS

1. A speech device including speech storage means in which a plurality of recorded human speech terms are stored, said device being arranged such that each respective stored speech term can be individually selected by a control means to provide an audible output.
2. A device according to Claim 1, comprising a speech storage device which is able to store individual speech terms in an essentially analogue form.
3. A device according to Claim 2, wherein each individual speech term is stored within a particular addressing area of the speech storage device.
4. A device according to Claim 2 or Claim 3, wherein each speech term is stored in related addresses within the speech storage device.
5. A device according to any of Claims 2 to 4, wherein the speech storage device is arranged such that upon input of a start address thereto, an output from the speech storage device may be generated.
6. A device according to Claim 5, wherein following the start address input, the speech storage device will automatically read out from related address locations until a given speech term has been output in its entirety.
7. A device according to any of Claims 2 to 6, wherein said speech device is provided with address decoding means for converting an output of the operation means of an apparatus to an address start location of the speech storage device.

8. A speech device according to Claim 7, wherein the address decoding means comprises an address storage ROM.

9. A telecommunication apparatus incorporating a speech
5 device according to any preceding Claim.

10. A control means for controlling operation of a device, the control means having a plurality of control elements for controlling functions of the device and being
10 associated with a background means, respective identifiers which include a character or characters for identifying the function of each control element optionally being associated with each control element, wherein the surface
15 appearance of each control element is visually contrasting compared to an adjacent area of said background means and each control element is visually distinguishable from an adjacent control element by a distinguishing means other than said identifiers.

20 11. A speech device substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

25 12. A control means substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.

30 13. Telecommunication apparatus substantially as hereinbefore described with reference to the accompanying diagrammatic drawings.



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Claims searched: 1 to 9

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Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.O): G5G (G6) ; H4J (JK) ; H4L (LECX) ; G5R (RGA)

Int Cl (Ed.6): G09B 21/00 : H04M 1/56

Other: Online : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage	Relevant to claims
X,P	GB 2292499 A (WINDOND) Whole document	1,9
X	GB 2124854 A (TEAM CONCEPTS) Whole document	1,9
X	US 5266034 (MITZ) See particularly lines 18-42 column 4.	1-8
X	US 5140632 (ANTEN) Whole document	1,9
X	US 4700377 (YASUDA) Whole document	1,9

X Document indicating lack of novelty or inventive step
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A Document indicating technological background and/or state of the art.
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